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USE OF HERBICIDES TO CONTROL WOODY NUISANCE PLANTS ON PUBLIC LANDS

by Eugene E. Woehler

A persistent problem on public wildlife lands is the invasion of trees and shrubs on undisturbed uplands and wetlands. Native grasslands, sedge meadows, seasonally flooded marshes, idled pastures, and croplands converted to nesting cover are vulnerable. The pattern of invasion will vary depending on the availability of seed sources and the condition and disturbance of the existing cover. A disturbance includes any one or a combination of physical changes created by cropping, burning, pasturing, flooding, or using herbicides or off-road vehicles.

The presence of seed-bearing trees or shrubs on or near disturbed areas insures the probability of woody plant establishment. Wind-dispersed seeds of aspen, cottonwood, and willow may be deposited miles from their origin. Winged seeds of maple, ash, and elm easily spread up to a half mile from the seed tree, while fruits of multiflora rose, autumn olive, cherry, and dogwood are consumed by animals, but are seldom digested and may be deposited miles from their source. Undigested seeds are naturally scarified and can germinate in undisturbed environments.

The invasion of aggressive woody species is a process of natural succession. Left uncontrolled, some open fields can revert to dominant woody cover as early as the fifth year. Property managers must be constantly alert to the early establishment of trees and shrubs in open fields and meadows before major problems develop. In this "Findings" issue, I summarize herbicide control techniques, principally in tabular form, for the management of invasive woody plant species.

Herbicides to Use

Eradicating nuisance woody plants with herbicides is one of several options. Mechanical treatment, grazing, and interspecific plant competition are other techniques that should be considered first. Used according to label directions and adhering to state and local regulations, herbicides are effective in controlling most problem species of shrubs and trees (Table 1).

The response of woody trees and shrubs to some herbicides can be altered by timing, change of rate, or application method. Multiple treatment techniques are possible with some herbicides (Table 2). Pelleted or granular herbicides however, are applied to soil only. A foliar application will be less effective if applied too early in the growing season or if it rains

Table 1. Herbicides used to treat nuisance woody plants.

Woody Plant	Herbicide *																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
American elm	X**		X	X			X	X	X			X	X	X	X	X	X		X	X
Aspen	X		X			X		X	X	X		X	X	X	X			X	X	X
Black locust	X		X					X	X	X		X	X	X	X			X	X	X
Boxelder	X	X	X	X		X	X	X	X			X	X	X	X	X	X		X	
Cottonwood			X					X	X	X			X	X						
Honeysuckle	X		X			X			X		X	X		X	X			X		X
Multiflora rose			X							X			X	X					X	X
Poison ivy		X	X			X					X	X						X	X	X
Prickly ash								X	X	X										
Red osier dogwood	X		X	X			X	X	X	X			X	X	X		X			
Rubus sp.	X		X		X			X		X			X	X						X
Smooth sumac	X	X	X		X	X		X	X	X		X	X	X	X	X		X	X	X
Soft maple			X	X			X	X	X			X	X	X	X	X	X			
Willow	X	X	X			X		X	X			X	X	X	X	X		X		X

* See Table 2 for herbicide names and application methods.

** Field trials and label recommendations were used to determine effectiveness; a lack of response indicates either resistance to the herbicide or that information on effects is unknown.

Table 2. Herbicide names, manufacturers, and application methods.*

Table 1 Number	Herbicide (Manufacturer)	Application Method
1	Amdon 101 (Union Carbide)	Basal dilute, tree injector
2	Ammate X-NI (DuPont)	Frill with notches, cut stump
3	Banvel (Velsicol)	Low- and high-volume foliar spray, basal dilute, frill girdle, cut stump, tree injector, granular soil pellets
4	DMA-4 (Vertac)	Frill girdle, tree injector, hypo-hatchet
5	Dozer (Hopkins)	High-volume foliar spray, basal dilute, granular soil pellets
6	Esteron 99 Conc (Vertac)	Low-volume foliar spray
7	Formula 40 (Vertac)	Frill girdle, tree injector
8	Garlon 3A or 4 (Dow)	Low- and high-volume foliar spray, basal concentrate, basal dilute, tree injector, hypo-hatchet
9	Hyvar X-L (DuPont)	Basal concentrate, basal dilute, low-volume foliar spray
10	Krenite (DuPont)	Low- and high-volume foliar spray
11	Oust (DuPont)	Low-volume foliar spray
12	Roundup (Monsanto)	Low- and high-volume foliar spray, foliage roller wiper, cut stump, tree injector, hypo-hatchet
13	Spike 80 W (Elanco)	Basal concentrate, granular soil pellets
14	Super brush killer (PBI/Gordon)	Cut stump
15	Tordon 101 (Dow)	Low- and high-volume foliar spray, basal dilute, cut stump, tree injector, hypo-hatchet
16	Velpar L (DuPont)	Granular soil pellets
17	Weed-Rhap A-4D (Vertac)	Frill girdle
18	Weed-Rhap-LV-40 (Vertac)	Low- and high-volume foliar spray, cut stump, hypo-hatchet
19	Weedone CB (Union Carbide)	Basal dilute, cut stump
20	Weedone 170 (Union Carbide)	Cut stump, low- and high-volume foliar spray

*Reference to a manufacturer does not constitute an endorsement of the product. Formulations of some herbicides may also be available through other companies.

Table 3. Guidelines for herbicide applications in treating nuisance woody plants.*

Application Method, Period, and Appropriate Conditions	Procedure
Low-volume foliar spray June-September Aerial application to wooded tracts	Apply a diluted concentration (1 1/2-3%) to foliage with aircraft, mist blowers, or sprayers. This method is non-selective and affects all plants. A drift control agent is necessary to protect non-target areas.
High-volume foliar spray June-September Woody plants not forming a closed canopy, areas accessible to equipment	Apply a diluted concentration (1 1/2-3%). Equipment varies from small, hand-held or backpack sprayers to agricultural crop sprayers.
Foliage roller wiper June-September Dense, uniform shrub growth 6 ft or higher	Apply to carpet-covered wipers that wet foliage on contact. Equipment varies from hand-held to tractor-mounted sprayers.
Basal concentrate Anytime except during snow cover; drift limited, selective for stems $\leq$ 5 inch diameter, brush clumps	Apply using a spot gun that delivers 2-4 ml of concentration per load. Apply 2 ml per inch of basal tree diameter. A 2-3 ft sterile zone is created around the treated trees for 2 growing seasons and non-target trees may be killed if their roots extend into treated zones.
Basal bark dilute Anytime except during snow cover; drift limited, selective for stems $\leq$ 5 inches diameter, brush clumps	Apply by saturating the lower 15-20 inches of treated stems with a diluted mixture. The method results in a slow response (symptoms may not develop for 1-2 months), requires a fuel oil carrier, and sterile zones may remain for up to 2 years around the base of treated stems.
Frill girdle April-October Trees $\geq$ 5 inch diameter	Apply 1 ml of undiluted herbicide into axe cuts spaced every 2 inches, about waist height around the tree. The method is selective but labor intensive.
Frill with notches Anytime except during snow cover and heavy sap flow in spring	Space cuts every 4-6 inches or 1 cut per 2 inches of stem diameter. Place undiluted herbicide into notches. The method is selective but labor intensive.
Cut stump April-December Saplings and trees $\geq$ 2 inch diameter	Apply herbicide within 1 week after cutting, avoiding heavy spring sap flow. Use low-volume sprayer or paint stumps with a brush and add a coloring agent to identify treated stems. The method is selective and will not affect non-target species.
Tree injector May-September Trees $\geq$ 5 inch diameter	Apply with a special tree injector that delivers 1 ml per cut and inject every 2 inches of circumference at base of tree. The method is selective and will not affect ground cover.
Hypo-hatchet May-November Trees $\geq$ 5 inch diameter	Apply at 1 cut per inch of stem diameter. The method is selective, labor intensive, and requires special hypo-hatchet equipment.
Granular pellets Anytime except during snow cover; any tree or shrub	Apply by hand or cyclone spreader near trunks; quantity of herbicide used depends on formulation and tree density. Herbicide will affect ground layer non-target species wherever pellets are dropped.

* Remember that you are responsible for the proper storage and use of herbicides and an assessment of their risk to the environment. DNR personnel are reminded to consult the Secretary's directives for using pesticides.

within 6 hours of treatment. Dense foliage may prevent good penetration of a foliar application and lower the percent of control, whereas the same herbicide applied as a basal treatment at the proper time can be 100% effective.

Stand density, acreage, accessibility, species composition, availability of equipment and labor, and presence of desirable species are important factors to consider when selecting application techniques (Table 3).

Eugene E. Woehler retired recently after 36 years as a wildlife research biologist for the Wisconsin Department of Natural Resources. He is known for his work on habitat management, prairie restoration, and pheasant propagation.

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